Technology Grants and Rural Schools: The Power to Transform

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The requirements of No Child Left Behind Act of 2001 (NCLB) has presented challenges for schools and districts across the United States such as a new need to focus on test scores and student achievement. While all states, districts, and schools face challenges that require them to adjust the structure and delivery of instruction in their schools, the small population and geographic isolation of rural schools can make change even more challenging (Reeves, 2003). Some have suggested that one way some rural schools may be able to overcome these challenges is through an increase in the level of technology integration in their school (Collins & Dewees, 2001). Schools struggle not only to implement and integrate technology into their curriculum, but also struggle to find the funds that they can allocate to the purchase and maintenance of technologically-enhanced instructional strategies. Fortunately, the high cost of technology and the potential educational impact of technological resources have led to the awarding of federal and state grants to facilitate the implementation of educational technology in schools (Herr & Brooks, 2003). This study examines one school's attempt to use grant money to purchase and integrate specific instructional technology into their school in order to increase student achievement.

Rural Schools

Schools in rural areas or small towns make up nearly 42 percent of all schools in the United States and represent 30 percent of students in the country (U.S. Department of Education, 2002). A rural school is defined as a school in a community whose population is less than 25,000 people (Mathis, 2003). These schools face many challenges due to their unique characteristics including: geographic isolation, declining enrollment, small population, limited funding, and lack of access to services (Reeves, 2003). Further compounding the challenge is the frequent use of funding formulas that allocate funds to districts on a per-pupil basis. These formulas are often used by federal and state agencies to distribute money to schools and puts rural schools at a disadvantage as they attempt to supplement their budgets (Hadderman, 1999). The availability of funding for rural schools often impacts their ability to access programs, services, and training opportunities, and plays a role in their inability to build capacity to comply with the standards set forth in the NCLB Act (Reeves, 2003).

Technology and Teacher Attitude

Teacher attitudes toward technology influence the level of technology integration in schools. According to the National Center for Educational Statistics (NCES), less than 20% of teachers reported feeling very well prepared to use technology in their classroom instruction (USDE, 2002). Training teachers to integrate technology is another way rural schools can invest educational technology. Once rural schools have successfully recruited "highly qualified" teachers and provided them with technology, schools must provide ongoing training in technology as well as administrative support in order to facilitate successful implementation of technology-facilitated instruction (Wang, Johnson, & Pisapia, 1994). Heath et al. suggest two factors that influence teacher attitude change toward technology integration are (1) having a willingness to change, and (2) the control structure of the school environment. Allowing teachers to see the potential benefits of technology for themselves and their students may help facilitate an attitude of willingness to change. Additionally, maintaining a power structure in the school that allows teachers the freedom to move from one stage of technology integration to the next in a supportive and non-dictatorial manner allows teachers to feel empowered to introduce technology into their instruction. Heath et al. (2000) also found that professional development and training in technology enabled many teachers to integrate technology effectively. Providing opportunities for exposure and development of positive teacher attitudes toward technology, is the beginning of the change process as schools try to move toward technologically integrated instruction.

The nature of rural schooling, teacher attitudes toward technology, and the utility of technology to impact teachers' instruction, are all factors that must be considered as schools look to provide an education for students that optimizes learning opportunities and provides cost-effective instruction. The potential impact of technology to

influence student achievement and school performance in this "age of accountability" for schools, raises questions about the actual outcomes and processes related to a grant-supported infusion of technology.

Research Questions

In order to better understand how technology could change attitudes and practices at a rural middle school, we focused on two research questions: (1) How does a grant-related influx of technology in a rural school affect teacher and administrator attitudes toward technology use/integration? (2) How does a grant-related influx of technology in a rural school affect the integration of technology in teacher planning and delivery of instruction?

Setting

Context

Ed Tech Competitive Grant Program. This grant program is funded by the Federal Government through NCLB but administered through state departments of education. School corporations are eligible for grants of up to $300,000. A grant application is required to have clear goals and objectives related to the school improvement focus of the district. In this particular state, 19 schools were funded in 2003-2004 academic year. Schools had to meet one or more of the following criteria to qualify for the *Ed Tech Competitive Program* grant: either it is one of the school corporations (a) among the highest poverty districts in the state, or it is a district (b) identified as in need of improvement according to the state based on state standardized test scores (Office of Learning Resources, 2004). This study focuses on only one school district that received the grant. While it may have similarities to other schools that qualified for the funding, each district is its own unique case.

Community School District

Community School District is comprised of four elementary schools, one middle school and one high school and has a total district enrollment of approximately 3,065 in a county with a population of 17,281. This qualifies it as a rural school as defined by Mathis (2003). The district has 3 elementary schools, one middle school and one high school. The focus of this case study is the middle school environment, because this is where the technology grant was targeted.

Implementation

The stated goals of the district in the approved grant application were:

- The percentage of 7th and 8th graders passing the 2004 ISTEP+ English/Language Arts test will increase by 10 points over the 2003 percentage.
- Teachers will employ three new teaching strategies during the 2003-2004 school year.
- Average student performance on the reading portion of the Standards-Based Adaptive Measure Test will increase by at least one grade-level equivalent.

(Technology Coordinator, 2003)

The school's efforts to meet these goals included the purchase of fifteen laptop computers for teacher-use in planning the integration of technology into their curriculum. Another thirty laptops were included for student classroom use. Teachers were chosen for participation based on their ability to attend a summer workshop, and represented both core (language arts, math, science) and other content areas.

Three software programs were used to support district goals. Inspiration™ was used to allow the graphic organization of student-generated ideas for writing assignments (Inspiration Software, 2004). Additionally, once a quarter, teachers used Socratic Seminar™ with the expectation that student writing skills would improve across the curriculum as measured by a rubric-scored periodic writing prompt (Technology Coordinator, 2003). And finally, an Integrated Learning System, PLATO™, was used to promote reading across the curriculum. Each program was chosen based on quantitative research studies, meeting the needs of the grant, and the NCLB Act for scientifically based research (Brush, 2002; The Institute for the Advancement of Research in Education (IARE) at AEL, 2003). Professional development, including a summer workshop and monthly professional development workshops, assisted the district in reaching their goals. The training included workshops regarding the use of the laptops for teacher planning, the use of PLATO™, Socratic Seminar, and Inspiration™ software with students, and developing technology rich lessons.

Participants

The participants in the study were a convenience sample of teachers from the faculty of a rural Midwestern middle school. Interviews began with administrators who were gatekeepers to other participants. A snowball sampling method was used by which the initial participants recommended other teachers to interview. fifteen interviews were conducted using this method.

Each participant was a volunteer who had in some manner interacted with the grant technology and training, or was a teacher in the target building for the grant. These volunteers were derived from three groups: (1) teachers participating in the grant training who received teaching resources related to the grant, (2) teachers who did not participate in the grant but who taught in the same building, and (3) administrators who helped write or implement the grant, those that supported teachers involved in the grant, or building administrators that were directly impacted by the presence of the grant. Administrators included the local building principal, assistant superintendent, district technology coordinator, a building media specialist, and a district technology support professional. Teachers were representative of various levels of teaching experience and content areas that included: language arts and reading, social studies, science, mathematics, and also special education.

Methods

The study was conducted as a multiple, qualitative case study of administrators and faculty working in rural school district in order to examine how receiving a technology grant might impact a school community. For the purposes of this study, qualitative research is defined as that which "seeks answers to questions that stress how (sic) social experience is created and given meaning" (Denzin & Lincoln, 2003, p. 13). Also, for this research study, a case study is defined as "a phenomenon of some sort occurring in a bounded context" (Miles & Huberman, 1994, p.25).

Data Collection Procedures

District and state-generated grant applications, reports, and other relevant documents presented by the district to the state agency that administrated the grant, were obtained from the district administrators both in paper and electronic form. Each of these documents was reviewed in conjunction with the data obtained using one of two primary methods- interview and observation. Individual teacher and administrator interviews were conducted and recorded on audiotape. These interviews were transcribed in their entirety.

Interviews. Interview data was recorded using audiotape in order to capture the responses of teachers and administrators, and transcribed in order to record their thoughts, experiences, and self-report interactions related to the grant. Interview questions were based on the overarching research questions; yet, the interviews were semi-structured to allow follow up questions and further probing. Questions focused on the impact of the technology grant on the environment, teaching practices, and attitudes of teachers and administrators that may have been impacted by implementation of the grant.

Classroom observations. Some participants were asked to allow a researcher to observe their classroom during a lesson utilizing technology. Notes were taken by the observer, but no video or audio tape was recorded, and no students were recorded. The researcher made general observations about the classroom, teacher and student behavior, and classroom activities. While technology use and integration was the focus of the observation, the overall classroom experience provided insight into the culture of the school.

Data Analysis

The collected qualitative data was analyzed using standard coding procedures as suggested by Gall et al (1996) and Denzin and Lincoln (2003), in order to identify emerging themes to support research conclusions. These procedures included the coding of repeated ideas and the collection of these topics into broader themes. Once these themes were identified, they were classified into relevant categories for later interpretation and use in supporting the findings of the researchers. Specific methods of analysis for the interviews and observations are described below.

Interview and observation analysis. Transcription of fifteen taped interviews was conducted by each interviewer in the interests of accuracy and completeness. Each transcript was typed verbatim from interview tapes and provided for coding and analysis. The number of researchers was limited to two writing and coding the transcripts, for the purpose of establishing a relevant coding scheme and generating useful themes for explaining the results. This analysis reflects procedures recommended Denzin and Lincoln (2003), Gall et al, (1996), and Carspecken (1996).

Handwritten notes from the observations were typed and were included for consideration as themes were drawn from the interviews. These observations served to triangulate the findings. Triangulation, a strategy for verifying the internal validity of the documents, was conducted by correlating the observations with participant interviews and the examination of received documents (Gall et al., 1996). Themes generated by the two researchers

were debriefed by other team members. This collaboration allowed those group members who had conducted the original interviews and observations to verify that the themes were accurate and allowed a consensus to emerge related to the findings and implications.

Results and Discussion

Through our fifteen interviews, trends began to emerge. The most prevalent trends were related to the first research question, "How does a grant-related influx of technology in a rural school affect teacher and administrator attitudes toward technology use/integration?" In relationship to this first question, while both groups may have shared positive attitudes, it became evident that their overall goals differed. Though only having two observations, some gains related to the second question, "How does a grant-related influx of technology in a rural school affect the integration of technology in teacher planning and delivery of instruction?", were observed through teachers sharing their own experiences.

How does a grant-related influx of technology in a rural school affect teacher and administrator attitudes toward technology use/integration?

Teachers shared how having the laptops allowed them to use more technology. The portability of the laptops helped to increase their comfort level with technology. A common comment reflected how they could now use the computer at home, on their kitchen table, in their recliner, or in their family room while watching television. Being able to take the computer home gave the teachers a greater sense of ownership and they found themselves using the computer for personal tasks. For example, one teacher related that she started to use power point with her Sunday School classes as well. Another was using computer applications for her home business.

Support

Teachers related that that the time was important to assist them in using technology. As one teacher related, the workshop allowed her time to set up the computer into a usable form.

> I thought the most useful part was having time to get to use the laptop and start storing things that you could use in class during that four-day session. I really used that a lot. Since they were brand new they did not have RealPlayer downloaded and we got all of that done. And usually that is the kind of thing that you put off because it takes so long to do and you are teaching. So that was wonderful I thought.

The social studies teacher had used the extra time given to him to use the Inspiration™ software himself, and found that the chance to experiment was vital in deciding if he would use it or not. "That is one thing, if the teacher doesn't feel comfortable using it; they are not going to use it."

In addition to benefits stemming from district support in the form of increased time, teachers related that their collaboration efforts have increased. Teachers in the laptop program work together to solve similar problems and ask each other for help. A teacher who is a novice in computer technology stated "It gets me around the building a little bit more so I can talk to my colleagues that I haven't seen for awhile." One teacher related how she worked with less experienced teachers to get their gradebook software working properly. Teachers related that they felt they could ask each other for help when they needed it or the technology support people were unable to provide an answer. One teacher noted an increase in communication.

> Email has probably increased 500% in the building, where teachers will communicate. I think communication is better on some level. So yeah, I think that improved that. And the collaboration, Mary is on the other team, she'll say that is a good idea, and maybe she will want to try that with her team.

School-wide support. In addition, to the summer workshop, there was just-in-time support available throughout the school year. In Community Middle School, there is a media specialist who is very accessible to teachers. When interviewed, she recognized the importance of her role in the success of the grant, "And I know that, unless you have someone there who can fix problems, teachers will quickly become frustrated and won't use it any more, they give up. They just won't use it." She was a problem solver and helped teachers when they struggled with the technology. The portability of the laptops made this even easier. "So a lot of the time, if I have a quick technology question, I will just pick up my laptop and go sit and 'What do you do here?' 'How do you get this?" The media specialist worked closely with the district level staff and provided one-on-one teacher training. She would sometimes guest-teach classes or sit down one-on-one with a teacher to help them overcome technology problems.

How does a grant-related influx of technology in a rural school affect the integration of technology in teacher planning and delivery of instruction?

Differences in technology use could be observed in teachers. Additionally, the support structure provided evidence of how teacher technology integration was being supported.

It was reported that teachers who had not been using technology started using technology. Different participants often talked about one very experienced science teacher, who considered himself a novice when it came to computer technology. One teacher said,

> We have two science teachers, who didn't ever use technology and they had their kids in the computer lab this year. I think this may be because they agreed to take the kids to PLATO™ so then they have gotten more comfortable and have moved to our Mac lab to do other things.

When interviewed, the teacher who had limited use with computers related, "Technology, I didn't like it very much-I like it a lot more now, a lot more now." Examples of how teaching practice changed were seen throughout the school. Teachers not involved in the grant benefited from shared information from their colleagues. A non-participating coach began using a spreadsheet to keep track of students' weight training with the help of a grant teacher. Also, a social studies teacher changed his attitude about allowing his students to use technology after being given the laptop. In an interview he said, "I used to not use computers at all, as far as instruction and stuff like that. A lot of time in my research projects that my students would do, I would ask them not to use any computers."

Limitations

There were some difficulties with the grant which affected teacher buy-in. One is the design of the grant, and how teachers were required to choose participating classes. Another was the lack of student data to corroborate the findings about classroom technology use.

The Design of the Grant and Teacher Concerns

Teachers had many concerns over the design of the grant. During the summer workshop, they collaborated to develop a way in which one group of students could be involved in a project all day long. Once school started they found that administrators had determined the intervention would be implemented in a different way, as related by one teacher.

> I don't think that we will have anything to prove anyway because we were supposed to have just one group of kids that we're tracking and looking for improvement by using this technology and we are supposed to see improvement in reading. I would be really surprised if we had five kids in common between the three teachers on our team that are doing it, which is going to be statistically nothing. We are not going to be able to do anything. I mean this is like, our concern is, we are doing this whole big grant, and we are not going to have these things measurable and I don't think we are. And I don't think we will have anything that we can draw conclusions from.

Another participating language arts teacher said "I wish that the 'be-all and the end-all' of the success of a program did not rest on test scores." In addition to the teacher's concerns, the researchers noted there were other interventions going on in the school to improve test scores with the same groups of students. Inspiration™ had been previously available at the school and teachers had been trained in using it for two years prior to the implementation of the grant. Teachers not participating in the grant were using the software with their students as well.

Impact on Students

Due to limited access to student information, student achievement was not a focus of the study, but teachers were asked for general impressions of student achievement, a measure that we speculated would impact the teachers' attitudes toward technology use. These observations were mixed among the interviewees. A nonparticipating teacher stated she was not sure if it had an impact on students because she sees a big change in students every year from beginning to end, and could not attribute the changes she was seeing to grant participation or not. She did not feel that her choice not to participate disadvantaged her students in any way "Well, I don't feel that my students have been hurting this year, because I feel like I am good teacher, and I do everything I can to make sure they can achieve and meet the standards."

Implications

These concerns and observations provide insight for similar implementations in the future. Teachers wanted to be included in decisions involved with the grant and felt that they were overlooked in its design. In addition, student-outcomes are hard to measure in such a short period of time. The importance of formative and summative assessments is vital in this respect. For example, this grant relies heavily on teacher perception of student success as formative assessment, and a SAMS test as a summative assessment. Teachers really have no clear measure on whether the student achievement is changing throughout the year, especially related to the state's high

stakes standardized test. Better formative assessment may help with teachers' understanding of the connection between the software and student achievement, and in turn, help them participate in meeting the goals of the grant. Those involved in administering the grant program were aware of the hard data that the software programs could provide, but there was no structure to use it in a formative manner.

The laptop program is successful in familiarizing the teachers with technology and increasing their comfort levels using the programs. Teachers reported using the technology in new and different ways. Teachers have adapted their lesson plans to utilize the technology and integrate it to meet various components of their coursework. As mentioned earlier, Heath et al.(2001) suggest two factors that influence teacher attitude change toward technology integration: (1) having a willingness to change, and (2) the control structure of the school environment.

The results of the interviews at this rural school provided evidence of a willingness to change as shown by teachers who had not used technology, began to utilize it in their classrooms. One area that might be impeding change is the powerlessness that the teachers felt in relationship to the research design. By increasing teacher's ability to input into the research and grant process, this school may be able to increase the number of teachers embracing technology as part of their teaching practices.

While not generalizable to all schools that receive federal grant funding, this case illustrates several ideas that are found on the literature about technology integration. For example, like Wang, Johnson, & Pisapia (1994) found, providing time and support is important in supporting teachers in adopting new technology. In addition, as Reeves (2003) discussed, funding can be a tool to assist a school in complying with new requirements, such as legislation. The influx of grant funds into this rural school allowed the teachers and administrators to focus considerable attention on complying with NCLB regulations.

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